Endangered *Lupinus mariae-josephae* species: conservation efforts

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State of art and aim: A lupin endemism, *Lupinus mariae-josephae* (Lmj), singularly has been identified in the Valencia province, in Eastern Spain. This lupin thrives in alkaline-limed soils with high pH, a unique habitat for lupins, from a small area in Valencia region. In these soils, Lmj grows in just a few small, defined patches, and previous conservation efforts directed towards controlled plant reproduction have been unsuccessful. This lupin was thought to be extinct in Valencia until 2007, when it was discovered in a limestone patch. The reasons behind Lmj endangered status are presently unknown. This study will focus on the symbiosis between Lmj and rhizobia, and how this relationship might impact the population size of Lmj. We have previously shown that Lmj plants establish a specific root nodule symbiosis with bradyrhizobia present in those soils, and we reasoned that the paucity of these bacteria in soils might contribute to the lack of success in reproducing plants for conservation purposes.

Results and discussion: Greenhouse experiments using bait soil and Lmj trap-plants showed the absence or near absence of *L. mariae-josephae*-nodulating bacteria in "terra rossa" soils of Valencia outside of Lmj plant patches, and in other "terra rossa" or alkaline red soils of the Iberian Peninsula and Balearic Islands outside of the Valencia Lmj endemism region. Among the bradyrhizobia able to establish an efficient symbiosis with *L. mariae-josephae* plants, two strains, LmjC and LmjM3^T were selected as inocula for seed coating. Two planting experiments were carried out in consecutive years under natural conditions in areas with edapho-climatic characteristics identical to those sustaining natural Lmj populations, and successful reproduction of the plant was achieved. Interestingly, the successful reproductive cycle was absolutely dependent on seedling inoculation with effective bradyrhizobia, and optimal performance was observed in plants inoculated with LmjC, a strain that had previously shown the most efficient behavior under controlled conditions. Our results define conditions for *L. mariae-josephae* conservation and for extension to alkaline-limed soil habitats, where no other known lupin can thrive. In general terms, the singular conclusion is that symbioses impact the distribution of leguminous plant populations, especially endangered legumes, and this should help define future strategies for the conservation of native legume populations.

References:
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